magnitude was estimated by Mr. OLIVIER to be 1.8, and the tail could be made out for eight or ten degrees. Numerous photographs have been made of it with the Crossley Reflector and with the Crocker cameras. In general, the head has been "umbrella-shaped," often showing well-marked concentric envelopes. The edges of the tail are much brighter than the center, which has occasionally been marked by a dark lane. The tail is of the streamer type, and both it and the details about the head change in aspect from night to night, but sudden changes and condensations do not appear. A very faint secondary tail is shown on the plate of April 29th, starting about two degrees from the head and making an angle of about fifteen degrees with the main tail. Some evidence is seen also of a faint jet directed toward the Sun.

H. D. CURTIS.

NOTE ON THE ORBITS OF COMETS HALLEY, *a* 1910, AND *e* 1909 (DANIEL).

The orbits of these three comets have recently been computed in the Berkeley Astronomical Department, and have yielded most satisfactory results from the standpoint of tests for Professor LEUSCHNER'S methods of deriving differential corrections for the removal of residuals. The character of the orbits is different in all three cases. Halley's Comet furnishes an example for a very long arc in the case of a nearly parabolic orbit; Comet *a* 1910 for a parabola from both a short arc with unequal intervals, and a moderate arc having one position at the very trying place near perihelion with a very small heliocentric distance; and Comet *e* 1909 (DANIEL) furnishes an example for an ellipse of about six years' period from a moderate arc. The last also illustrates very neatly the great adaptability of the method in that the computers carried on the work for both parabola and general conic at the same time, with comparatively little extra labor.

The elements of Halley's Comet were computed by R. T. CRAWFORD and W. F. MEYER from observations of 1909 September 17, 1909 December 16, and 1910 February 28. They are:—

$T = 1910$ April 19.67760 Gr. M. T.
$\omega = 111°\ 43'\ 09''.32$
$\Omega = 57\ 16\ 18\ .09$ } 1910.0
$i = 162\ 12\ 55\ .57$
$\log e = 9.985\ 5082$
$\log a = 1.252\ 5224$
$\log q = 9.768\ 6346$

The perturbations due to the action of *Mars* at its nearest approach to the comet, during January, 1910, were computed and found to be ineffective.

The elements of Comet *a* 1910 were computed by W. F. MEYER and Miss SOPHIA H. LEVY. The first set was derived from observations of February 1st, 2d, and 5th. The final set was based upon observations of January 18th, February 5th, and March 13th. They are:—

$T = 1910$ January 17.0888 Gr. M. T.
$\omega = 320°\ 54'\ 40''.3$
$\Omega = 88\ 47\ 24\ .1$ } 1910.0
$i = 138\ 46\ 47.9$
$q = 0.128980$

The largest residual for this orbit is 3″. An observation of April 13th, by AITKEN, shows the residuals—

$$O-C \begin{cases} \cos\delta\,\Delta\alpha = -0^s.9 \\ \Delta\delta = -4'' \end{cases}$$

An orbit for Comet *e* 1909 (DANIEL), showing a period of 7.15 years, was derived by STURLA EINARSSON and R. YOUNG from observations of December 11th, 15th, and 18th. A longer arc became available so that their final elements depend upon observations of 1909 December 7, 1909 December 18, and 1910 March 3. They are:—

$T = 1909$ November 28.7238 Gr. M. T.
$\omega = 3°\ 28'\ 43''.9$
$\Omega = 70\ 59\ 43\ .4$ } 1910.0
$i = 19\ 26\ 48\ .1$
$e = 0.602481$
$\mu = 547''.5362$
$\log a = 0.541063$
Period = 6.48030 years

All three cases required the use of LEUSCHNER's closed expressions for δf and δg, which worked admirably.

R. T. CRAWFORD.

BERKELEY ASTRONOMICAL DEPARTMENT, April 21, 1910.

New Spectroscopic Binaries.

The following forty-two binaries have recently been discovered during the progress of the spectrographic work at the Lick Observatory and at the observatory of the D. O. Mills Expedition, Santiago, Chile. They are taken from *Lick Observatory Bulletins,* Nos. 173, 177, and from a Bulletin soon to be issued by Dr. Moore:—

Star.	α		δ		Range.	Discoverer.
λ *Hydri*	0	45.1	−31°	57′	−12 to +6^{km}	Mrs. Moore
υ *Piscium*	1	14.0	+26	44	−1 to +22	Albrecht
π *Ceti*	2	39.4	−14	17	+8 to +21	Moore
κ *Persei*	3	2.7	+44	29	+27 to +32	Campbell and Albrecht
δ *Fornacis*	3	38.3	−32	15	−25 to +64	Moore
b *Persei*	4	10.7	+50	3	−4 to +52	Curtis
γ *Mensæ*	5	35.8	−76	25	+54 to +62	Mrs. Moore
ξ *Columbæ*	5	52.1	−37	8	+55 to +66	Mrs. Moore
δ *Canis Majoris*	7	4.3	−26	14	+33 to +36	Wright
27 *Canis Majoris*	7	10.2	−26	10	+86 to +115	Albrecht and Paddock
h^1 *Puppis*	8	7.8	−39	19	+17 to +30	Mrs. Moore
h^2 *Puppis*	8	10.5	−40	2	+12 to +28	Mrs. Moore
θ *Hydræ*	9	9.2	+2	44	−20 to +7	Campbell and Albrecht
δ *Antliæ*	10	24.9	−30	6	Both spectra	Curtis
ρ *Leonis*	10	27.5	+9	49	+35 to +58	Campbell
α *Ursæ Majoris*	10	57.6	+62	17	−4 to −10	Campbell
π8 *Virginis*	11	55.7	+7	10	−21 to +18	Albrecht
θ^1 *Crucis*	11	58.0	−62	45	−1 to −26	Mrs. Moore
η8 *Corvi*	12	26.9	−15	38	−12 to +18	Albrecht
β *Crucis*	12	41.8	−59	8	+6 to +25	Wright
ξ^2 *Centauri*	13	1.0	−49	22	−9 to +44	Moore
D. C. 6501	13	30.3	+37	42	+2 to +14	Wright and Allen
h *Centauri*	13	47.4	−31	47	−9 to +25	Paddock
η *Centauri*	14	29.2	−41	43	−11 to +6	Wright
α *Lupi*	14	35.2	−46	57	0 to +17	Albrecht
κ *Centauri*	14	52.6	−41	52	+4 to +17	Curtis and Paddock
d *Lupi*	15	29.0	−44	37	−2 to +20	Paddock
χ *Lupi*	15	44.6	−33	19	Both spectra	Paddock
γ *Apodis*	16	18.1	−78	4	+2 to +8	Wright
χ *Ophiuchi*	16	21.2	−18	14	−11 to +22	Campbell and Albrecht
υ *Scorpii*	17	24.0	−37	13	−2 to +38	Wright
σ *Draconis*	18	49.7	+59	16	−6 to −20	Burns
υ *Draconis*	18	55.6	+71	10	−3 to −13	Burns
η *Lyræ*	19	10.4	+38	58	−2 to −13	Albrecht
τ *Draconis*	19	17.5	+73	10	−27 to −34	Albrecht
ε *Draconis*	19	48.5	+70	1	0 to +6	Campbell
θ^1 *Sagittarii*	19	53.2	−35	33	−15 to +15	Paddock
θ *Cephei*	20	27.9	+62	40	−14 to +7	Moore

Star.	α	δ	Range.	Discoverer.
σ *Cygni*	21 13.5	+38 59	— 2 to — 12	CAMPBELL
ζ *Capricorni*	21 20.9	—22 51	— 4 to + 5	CAMPBELL and ALBRECHT
D. C. 9701	22 9.5	+39 13	— 9 to — 14	ALLEN
ζ *Sculptoris*	23 57.2	—30 16	—18 to + 13	PADDOCK

W. W. CAMPBELL.

APPOINTMENT OF DR. ALBRECHT.

Dr. SEBASTIAN ALBRECHT, Fellow in the Lick Observatory, University of California, 1903-06, Assistant 1906-08, and Assistant Astronomer 1908-, has been appointed First Astronomer in the Argentine National Observatory at Cordoba. Dr. PERRINE, Director of the Cordoba Observatory, is to be congratulated upon securing the services of Dr. ALBRECHT, whose departure from Mount Hamilton will be regretted by all, for both scientific and personal reasons. Dr. ALBRECHT expects to leave Mount Hamilton on or shortly after July 1st.

W. W. CAMPBELL.